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ABSTRACT

Interest in educating individuals, rather than classes, began in the time of the Greeks, but has escalated in the last century. As more and more students stay in school longer and longer, teachers have had to adjust their teaching to meet the needs of an increasingly diverse student body. One method of attending to the needs of individuals is to use diagnostic-prescriptive teaching. A historical perspective of this method, its uses in the classroom, and some ramifications for mathematics teacher education is provided in this document. After the introduction, definitions for key words that have been used throughout the years to describe individual differences are given. The body of the report is broken up into three parts. The first part describes the diagnostic aspect of the method, indicating the who, what, when, and how strategies for diagnosis. The second part describes the prescriptive aspect of the method, indicating when and how remediation should be done, and the particular needs of remedial pupils that lead to individualized instruction. The third section builds a case for including the diagnostic-prescriptive teaching method in the teacher training program by citing the large number of remedial courses now given at the college level and the relative lack of success these students experience in college mathematics. It is concluded that if every teacher would use a diagnostic-prescriptive approach to teaching, very little remediation at the college level would be needed. Until this happens, colleges will need to offer remedial programs. Approximately 130 references are attached. (MDH)

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Diagnostic-Prescriptive Teaching of Mathematics

A Historical Overview

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Abstract

Interest in educating individuals, rather than classes, began in the time of the Greeks, but has escalated in the last century. As more and more students stay in school longer and longer, teachers have had to adjust their teaching to meet the needs of an increasingly diverse student body. One method of attending to the needs of individuals is to use diagnostic-prescriptive teaching. A historical perspective is presented here.

Diagnostic-Prescriptive Teaching of Mathematics
A Historical Overview

Although the need to address individual learning abilities was recognized by Plato and Aristotle, the first attempt to study these differences between individuals was made by Galton in the mid-ninteenth century (Smith, 1953). Since then, interest in individual differences in learning has grown, especially at times when the population of a particular level of school was expanded to include those who were not previously enrolled at that level. In the early twentieth century, an increase in enrollment at the high school level meant that the students were no longer only those of high intelligence, but included many that were average (McCormick, 1929). As more children stayed in school longer, the population became more diverse. The same type of increase in population that occurred in the high school from 1900 to 1920 occured at the college level in the 1960's and 1970's. And with it came the need for accomodating the needs of a more diverse group of individuals.

At the same time that the population of schools was increasing, advances were made in testing. Standardization of tests was being accomplished, and tests in general were being improved (Reeve, 1926). Advances in the ability of educators to assess learning

enhanced the ability of teachers to identify individual differences. With further refinements in tests, specific weaknesses in the achievement of students could be diagnosed. With the ability to diagnose came the need to prescribe.

Throughout the years many terms have been used in describing individual differences and techniques of dealing with them. Some of the key terms are reviewed below.

Definitions

Although many educators have written about diagnostic-prescriptive teaching, few have defined it or other terms used in conjunction with it. Identification of children as individuals is a basic premise of diagnostic-prescriptive teaching.

Retardation

Currently "retarded" is a term reserved for children that are slower than slow learners. In the past, children were labeled retarded when their achievement was not up to grade level. Children could be and were considered to be retarded in specific subjects. The term did not necessarily imply a mental deficit, only a lack of achievement.

Dyscalculia

In recent history, many children have been labeled learning disabled. The specific learning disability in mathematics has been termed dyscalculia (Homan, 1970).

Although now used for learning disabilities in mathematics with unknown causes, the term was first used to describe children with brain disorders that affected their achievement in mathematics.

Disadvantaged

Gaonkar, Douglas, and Krishnan (1977) defined children who are educationally disadvantaged as those who receive substandard education. They were particularly concerned about the high-school education that children received, but their definition and discussion apply to the elementary school as well. If the education at each level provided for children in various locales is not comparable, the children cannot be expected to achieve comparably in the next level.

Remediation

Remediation is the education that takes place after some form of assessment has determined that the student has not achieved at the desired level. Implied in the process of remediation is the fact that the content being taught in the remedial phase of education was taught before and was not learn ed. Brueckner (1935b) defined remedial instruction as the "types of corrective measures that must be undertaken to remove interferences and to remedy handicaps that prevent optimal growth" (p. 1). Abbott and McEntire (1985) described remediation as instruction carefully designed to successfully teach what the children did not learn during the inital teaching of

the content. Whitcraft (1930) noted that remedial work has definite goals and is generally focused on elementary skills.

Diagnosis

Diagnosis is the assessment part of diagnostic-prescriptive teaching. Fuller (1946) emphasized the need for diagnosis to be completed in two stages. First, a measurement of some educational goal must be done, and secondly, the results of the mesurement must be interpreted in order to prescribe the remediation needed for the pupil. Goodstein (1985) also described assessment as a process of determining the achievement of the learner with the intent of finding the causes of nonachievement. In contrast, Oldaker (1976) described the purpose of diagnosis as identification of both the strengths and weaknesses in the child's learning. This identification of strengths as well as weaknesses reflects a different attitude about the process of diagnosis. Further expanding the idea of diagnosis, Schultz and Strawderman (1980) and Sadowski (1983) indicated that not only was the achievement of the pupil to be examined, but assessment should also be made of the learning processes used by the pupil and of content to be learned.

Prescription

After a diagnosis has been made, instruction must be defined for the child. Oldaker (1976) and Schultz and Strawderman (1980) describe prescriptive techniques as

the strategies that are used in designing instruction to correct the difficulties identified in diagnosis.

Diagnostic-Prescriptive Teaching

The combination of diagnosis and prescription results in diagnostic-prescriptive teaching. Riesman (1977) described three steps in this type of teaching. First, the child's level of achievement must be assessed; then, an analysis of the content to be taught must be made; and finally, appropriate instruction must be implemented. Glennon and Wilson (1972) defined diagnostic-prescriptive teaching as an effort to reteach content that the pupils did not learn during initial teaching. Fennell (1981) included in the reteaching an effort to use the child's learning style in order to optimize the chances of success. Although Fennell, and Glennon and Wilson wrote in terms of reteaching, they did indicate that diagnostic-prescriptive teaching should be done with all pupils, not just those having difficulty. This attitude also is evidenced in Riesman's book (1977) and by Berman and Friederwitzer (1981) and Fowler (1980).

Although most diagnostic-prescriptive teaching is used to find and remedy problems that children have with the content to be learned, ideally it should be used before children have the problems. The fact that so many children have problems in mathematics, need reteaching or remediation, indicates that the initial teaching was not effective. The diagnostic-prescriptive approach should

have been used in the first place (Glennon & Wilson, 1972). Recognizing each child as an individual and designing instruction to meet the needs of each child would eliminate much of the need for remediation. Blankenship (1985) listed five procedures that can be used in designing individualized instruction: (1) modification of the content to suit the individual; (2) adjustment of the rate and sequence of instruction; (3) change in the demands of the tasks; (4) use of various techniques of relaying information; and (5) selection of teaching techniques by recognizing their effects on the individual pupil. In each of these procedures, diagnosis and prescription must be used, both in assessing the pupil's needs and the effects of instruction and in the design of further instruction. The intent is not to individualize instruction only after a child has had trouble with a concept, but to individualize instruction so as to prevent problems before they develop.

Why people have trouble in mathematics?

It has been recognized that otherwise intelligent people can have trouble with mathematics (Skemp, 1980; Schmitt, 1921). Many reasons have been proposed as the causes for this discrepancy in achievement in mathematics and other areas.

Some children have problems learning mathematics because of a general low cognitive ability (Fernald,

1943; Whitcraft, 1930). Others are affected by medical problems (Lumb, 1980), specific learning disability or dyscalculia (Homan, 1970), or psychological and emotional problems (Tublock, 1957; Ross, 1964; Capps, 1969; Szetela, 1973; Lumb, 1980). Sometimes these emotional problems take the form of an anxiety associated with mathematics (Lazarus, 1974, 1975; Aiken, 1976; Tobias, 1978; Kogelman, Forman, & Asch, 1981). Lack of motivation may be another result of this anxiety and may become another cause of nonachievement in mathematics (Wallace & Larsen, 1978). Other emotional problems may be caused by the child's life outside of school, i. e., the home and community (Ross, 1964; Marshall, 1974).

Inadequate background and exposure to poor environmental experiences may have the effect of not providing the child with the necessary readiness skills for mathematics (Schmitt, 1921; LaBrant, 1967; Murphy, 1969; Dunkley, 1972). Although many have suggested that the inadequate background exists in the preschool years, Fernald (1943), LaBrant (1967), and Lazarus (1974) noted that problems arose due to the lack of preparation in school mathematics. Schmitt (1921) specifically recognized that the defects were in the education provided, not in the children.

Adequate learning in mathematics may not occur because some topics in mathematics are difficult (Whitcraft, 1930), or because the textbooks, materials, or curriculum were inadequate (Whitcraft, 1930;

Brueckner, 1935c; Buswell, 1926; Wallace and Larsen, 1978) placed part of the blame on the curriculum. However, the most commonly mentioned reason for the lack of achievement on the part of the pupils was the instruction that the pupils received. Poor, faulty, inadequate, unskillful, and ineffective were some of the adjectives used to describe the teaching that resulted in children developing problems in mathematics (Buswell, 1926; Whitcraft, 1930; Brueckner, 1935c; Guiler, 1946; Hoel, 1950; Cook, 1959; Jones & Pingry, 1960; Wallace & Larsen, 1978; Bohlen & Mabee, 1981).

Diagnosis

Diagnosis is the first half of diagnostic-prescriptive teaching. It is not an easy task to diagnose the needs of a pupil, either before or after instruction. Many teachers may wish to avoid the issue of diagnosis due to the difficulties involved; but diagnosis, and subsequent remediation, should not be reserved for those children who have problems but should be used with every child to insure that all are learning (Ashlock, Johnson, Wilson, and Jones, 1983; Berman and Friederwitzer, 1981). It is the teacher's responsibility to plan for individual differences within the classroom. If problems are diagnosed and the pupils provided with individual instruction, 90% of the problems in mathematics could be avoided (Cook, 1951; Cook, 1959). It is more important, and easier, to keep pupils out of

trouble than to remedy problems after they occur (Stenquist, 1935). Glaser and Cooley (1973) likened the process of teaching without diagnosis to the prescription of medicine without seeing the patient.

How to Diagnose

The easiest way for teachers to assess pupils' learning is through the use of standardized tests. Groups of pupils can be diagnosed in this way (Caldwell, 1969). However, the easiest method may not prove to be the best one. The information received about an individual child may not be sufficient to make the diagnosis meaningful. Other methods such as interviews, study of written records, activities, and the use of anecdotal records may be more useful (Brownell and Watson, 1936; Scovchik and Heddens, 1978; Capogianco, 1964; Fremont, 1975).

Brueckner (1959) outlined five steps in diagnosis: creation of a list of objectives, recognition of the behavior that exemplifies the objectives, creation of a test that measures this behavior, assessment and recording the behavior of the child, and interpretation of the data. The establishment of a list of specific goals to be assessed in diagnosis was also recommended by others (Whitcraft, 1930; Brueckner, 1935a; Thornton, Tucker, Dossey, & Bazik, 1983; Beattie & Scheer, 1985). In a diagnostic test, specific skills and understandings are evaluated. Therefore, diagnostic tests must address

these specifics and be able to identify systematic errors (Arthur, 1950; Cox, 1975; Underhill, 1981; Thorton, Tucker, Dossey, & Bazik, 1983).

Who should diagnose

Ideally, the major portion of diagnosis should be done by the classroom teacher rather than other school personnel. However, the teacher must be provided with techniques for diagnosis. Stockwell (1975) reported that not much help existed for the teacher in diagnosis; however, given a good diagnostic tool, teachers could use it to design appropriate curriculum. Moore and Platte (1959) described the creation of a diagnostic test by a group of teachers and found that it was successful in diagnosing. They also found that teachers wanted to diagnose and used the results of the test in their subsequent teaching. Scovchik and Heddens (1978) and McAloon (1979) discussed specific ideas that may be useful to the individual teachers in their attempts to diagnosis pupils learnings.

Children also can take some responsibility for diagnosis themselves. By noting teacher feedback on practice work, pupils may become aware of their weaknesses without further testing (Johnston, Maertens, and Schooley, 1969; Whitcraft, 1930). Of course, the computer was also recommended as a tool in diagnosis (DeVault & Kriewall, 1970; Bork, 1975; Bright & Lamon, 1987).

When to Diagnose

Most evaluation takes place after instruction to determine what the pupils have learned and, if the evaluation is diagnostic, to determine the remedial procedures to follow. However, remediation should take place before incorrect algorithms are fixed by the pupil since once children learned an algorithm it was difficult for them to return to the use of concepts previously understood (Berman and Friederwitzer, 1981; Engelhardt and Wiebe, 1981). This reluctance to use conceptual understanding may interfere with the success of any remediation. Therefore, diagnosis of problems must be done before practice on the algorithms.

At the very least, a diagnosis of pupils' learnings needs to be made at the beginning of each grade level (Morton, 1946); it should be done before any instruction (Trueblood, 1971), and the process should be started in kindergarten (Dunlap & Kalmey, 1980). However, diagnosing at the beginning of instruction is not enough. Diagnosis should be an integral part of the curriculum (Cook, 1951; Stenquist, 1935; Ashlock, Johnson, Wilson, & Jones, 1983). It should be a continuous process (Weaver, 1953), so that all teaching can be diagnostic (Schultz & Strawderman, 1980).

What to Diagnose

Since diagnosis is concerned with specific content, attention must be given to what content to assess during diagnosis. Early this century, Phelps (1916) discussed a

change in the nature of diagnosis. He stated that the focus of attention in testing was changing from a concern with the speed of computation to an examination of the computation to determine the specific errors being made by the pupils. Buswell (1926) also mentioned that one of the causes of failure in arithmetic was due to incorrect strategies used by the pupils. More recently, much attention has been given to the computational strategies used by children in an attempt to identify patterns (Cox, 1975; Pincus, Coonan, Glasser, Levy, Morgenstern, & Shapiro, 1975; Kilian, Cahill, Ryan, Sutherland, & Taccetta, 1980; Maurer, 1987). Analysis of errors in areas other than arithmetic, such as algebra, began in the mid-twentieth century (Snider, 1944).

The goal of all this concern about error strategies is to develop better ways of identifying such strategies and methods for reteaching the correct strategies. If common errors can be identified, teachers can then adjust the initial teaching to avoid them (Rees and Barr, 1984).

Prescription

Prescription is the second part of diagnostic-prescriptive teaching. Diagnosis is not an end in itself; it must lead to a prescription for teaching. If the diagnosis is done after initial teaching, then the prescription leads to a reteaching method or a plan for remediation. However, if the diagnosis comes before the initial teaching, then it can lead to a plan for

individualized instruction.

Remediation

When prescribing remediation, several factors are important. The content of the remediation may be the same as the initial instruction, or it may have a different focus. The needs of the remedial student, who has already failed at least once, must be considered. When and how the remediation is to be carried out are aspects for which planning must be made.

Content. If a student has been identified to need remediation, it is because he or she has not learned some topic or skill when presented with an instructional procedure. Therefore, the student has already failed. For this reason, attention must be given to the content of the remedial instruction. Remediation should be done in any area in which the pupils have not been successful (Peavler, DeValcourt, Montalto, and Hopkins, 1987), however, new content should be taught, or different teaching strategies used (Dyson, 1983; DeVault and Kriewall, 1970; Peavler, DeValcourt, Montalto, and Hopkins, 1987). Students in high school are sometimes deficient in arithmetic skills (Arthur, 1950), but reteaching the computational skills that were failed in the first place, probably would not be successful. Those same arithmetic skills could be retaught in job preparation courses (Ritsema, 1981) where less attention can be given to arithmetic and more to the skills needed

in everyday life (MeLeod and Armstrong, 1982).

When should remediation occur? Ideally, remediation take place immediately after a child's error is diagnosed. And, ideally, diagnosis is continuous. However more often, diagnosis is not continuous, and children are not remediated immediately. Suggestions have been made for resource rooms or remedial classes (Fuller, 1946), for after-school clinics (Ashlock, 1976), and for summer classes (Myers, 1972). Short, frequent remediation sessions are more successful than longer, less frequent ones (Mayhall and Jenkins, 1977).

How should remediation be done? Many techniques for remediation have been suggested and used. Some schools group children homogeneously and can provide a separate class of those children who need remediation (Jones & Pingry, 1960). This grouping implies the cooperation of school administrations and is valuable only for those children needing remediation in most areas. Since children usually need remediation only in certain subject areas, they could remain in the regular classroom for most instruction and be instructed in a resource room only for those areas that need remediation (Otto, 1927; Fuller, 1946; Griggs, 1976; Tobin & Bonner, 1977). The resource teacher in mathematics can then be an expert in mathematics education and not a general teacher. However, regular classroom teachers would be able to remediate on a much more continuous basis, given that

remedial materials were available (Neal and Foster, 1928). Other suggestions were to have two teachers in the class (Davis, 1976), to have tutors for the children needing remediation (Melton, 1976), and to use the computer to aid in diagnosis and/or remediation (Crawford, 1970; Devault & Kriewall, 1970; Gerardi, Reynolds, Cote, & Endenberg, 1983).

Needs of remedial pupils. For any remediation program to be effective, the special needs of the pupils must be considered. Since these students have already experienced failure, these needs may be different from those of the regular students. Above all, the content must be taught with meaning (Whitson, 1930; Harding, 1974; Pace, 1978). The use of concrete, manipulative materials has been seen as necessary to develop meaning by many educators over the years (Fernald, 1943; Fuller, 1946; Jones & Pingry, 1960; Herald, 1974; Bohlen and Mabee, 1981). Remediation was found to be more effective if it was individualized (Smith, 1916; Cooke, 1931). The failure that these students have experienced may make them more difficult to motivate; but such motivation is more important to their success (Kevra, Brey, & Schimmel, 1972; Denman, 1974; Lane, 1974; Marshall, 1974; Pace, 1978).

Individualized Instruction

There is no doubt that children are individuals. They develop at different rates, have different

experiences, and enter school with different backgrounds (Riedesel, 1980). Even if children are grouped homogeneously into classes by some variable, they still vary on many others (Riedesel & Burns, 1973; Good & Stipek, 1983). Therefore, teachers are faced with the problem of prescribing instruction for a group of children who are individuals. Historically, individualized instruction dates back to Socrates; and individualized instruction entered the schools as early as 1890 (Henderson, 1972). Young (1908) called for individualized teaching. He noted that teaching was hampered by large classes and advocated a move away for mass teaching toward an individualized approach.

Organization. Schools must organize children for instruction. Most schools begin with an organizational pattern that groups children homogeneously by age. However, this grouping pattern allows for classes to be very heterogeneous on other variables (DeVault & Kriewall, 1970). Within each age, or grade level, further grouping is possible. There are three levels on which decisions about grouping are possible. School-wide grouping programs, where children are grouped by achievement levels in the subject areas, are possible (McLaughlin, 1961; Riedesel, 1967). Departmentalization of a school makes individualization easier to plan (House, 1977). This is often the model used in the middle and high schools today. In addition to grouping

students into sections of a course, there has also been the call for, and development of, alternative courses, e. g., general mathematics courses (Hawkins, 1946; Schorling, 1926). However, this departmentalized model results in rigid time schedules for instruction which can limit the individualization possible. Even with homogeneously grouped classes, teachers can further divide the children into smaller groups for more successful instruction (Turkett & Purser, 1972). Models for classroom organization allowing for individualized instruction are described by Barnard & Thornton (1977) and Romberg (1977).

Individualizing instruction. Even if children are grouped for instruction, instruction must be adjusted to the needs of the children. Although some educators have been concerned about providing instruction in a common, core curriculum (Romberg, 1983), others felt that the content must be adjusted to the needs of the individual (McMeen, 1959; Chandler, 1978). The rate of instruction must be adapted to the pace of the group or individual (Moench, 1969; Noddings, 1969; Henderson, 1972; Schoen, 1976). Individualization cannot truely take place without consideration of the various learning styles and modes of learning used by the individual children (Cartwright, 1971; Henderson, 1972; Bachor & Freeze, 1986). Additionally, some attention must be given to the emotional needs of various groups (Burton, 1978; Kerber, 1978). As DeVault and Kriewall (1970) noted, mathematics

is a highly individual matter.

Teacher Training

It is the teacher's responsibility to adjust the curriculum and pedagogy to the individual children, even when the administration of a school supports the concept of diagnostic-prescriptive teaching, (Harvey, 1981). Teachers must be able to diagnose children and prescribe teaching strategies. Therefore, teacher preparation programs must include training in these areas (Young, 1981). Specific training in the diagnostic and prescriptive approach to teaching appears to be necessary (Reisman and Kauffman, 1980; Dodd, Jones, and Lamb, 1975; Fennell, 1978). However, teachers cannot be expected to become experts in diagnosis (Underhill, 1981). There is a need for a classroom model that can be used by teachers with little training (Denmark and Mumoz, 1980). Needed are diagnostic procedures that are easy to implement by the classroom teacher and mathematics specialists in the schools to do more extensive diagnosis and prescription.

Remedial Courses at the College Level

At the turn of the century, less than one-third of the high-school aged children attended high school. Since then there has been a dramatic increase in the numbers of students remaining in school through the high school years. Currently, most of the students entering community colleges would not have been in college twenty

colleges took on the responsibility of remediating them (Brase & Brase, 1976; Eisenberg, 1981; Leitzel & Waits, 1976; Gaonkar, Douglas, & Krishnan, 1977; Partee & Halsey, 1977).

Failure of high schools. In some cases, the students entering college had completed high school courses in the mathematics for which they needed remediation. Corn and Behr (1975) found that 56% of the students in remedial mathematics courses had already studied the same mathematics in high school. Apparently the high schools had failed to teach the students or the students had failed to learn what was being taught.

College Remediation Programs

Remediation at the college level has had a different focus from that in the elementary and secondary schools. At the lower levels of schooling, concern is given to the individual's needs, both in terms of pedagogy and content. In the high school, various courses are available for the students with differing needs and goals. However, at the college level, pedagogy may be adjusted, but in general, the content is fixed. The goal of the college-level remediation course has been to teach the standard mathematics prerequisite to other courses.

It is generally agreed that remedial students will be less successful in traditional courses that use the same teaching techniques which failed before (Peck & Jencks, 1973; Mansfield, 1974; Partee & Halsey, 1977).

When comparing a traditional course with a course using programed material, Collagan (1969) found the programed learning course was better. However, Corn and Behr (1975) found that programed learning courses were less effective than conventional ones. They also found that modular courses were more effective than conventional ones. Peer tutors can be a successful alternative if they have training in methods; knowledge of subject matter was not enough to be an effective tutor (Wepner, 1985). Some students need more than instruction in mathematics. They also benefit by receiving help in test taking skills (Miller & McDermott, 1983) and in dealing with the general college environment (Niemeyer, 1982).

Success of programs. Despite the widespread availability of college remediation courses, the success of them is not clear (Eldersveld, 1983). Head and Lindsey (1984) found that students passing the remedial mathematics course were more successful in a later course of college algebra, giving weight to the argument that these courses are worthwhile. However, although Archer (1978) found that students passing the remedial courses did achieve satisfactorily in subsequent college courses, only half of the students enrolled in remedial courses passed it. When students, who had failed the developmental course, repeated it, they generally did no better the second time (Archer, 1978).

Should Remediation be part of the College Curriculum

Eisenberg (1981) found that only 35% of the students

in remedial mathematics courses enrolled in more advanced courses; and of them, only 55% completed the subsequent course with a grade of C or better. This means that only 19% of the students in remedial mathematics courses went on to be successful in mathematics. With such a low success rate; and the question arises as to whether or not colleges should be in the business of teaching arithmetic, especially since the arithmetic should have been learned prior to college entrance. Since colleges and universities generally have limited financial resources, it can be argued that inefficient programs, such as remedial mathematics, should be eliminated (Gemignani, 1977). The elimination of remedial courses at the college level would mean that many students now in college would be refused admission. It may follow that high schools would attempt to do a better job of preparing their students, or that community colleges would continue to offer such programs, or that students needing remediation would just not be able to enter college.

There is no reason to believe that high schools that have not provided an adequate education in the past will be able to revise their curriculum and teaching to meet the demands of college entrance. In order to provide equal opportunity to all students regardless of background, Snowman, Leitner, Snyder, and Lockhart (1980) state that colleges must provide programs of remediation.

Serow and Daview (1982) note that equal opportunity means the opportunity to overcome deficits. Eisenberg (1981) argued that society in general, and the universities in particular, must make this opportunity available, even if it means subsidizing remedial programs. In todays' world of mathematics and science, successful remediation in mathematics may have the effect of increasing the pool of students capable of studying mathematics (Wepner, 1986).

Summary

Interest in educating individuals began in the time of the Greeks, but has escalated in the last century. As more and more students stay in school longer and longer, teachers have had to adjust their teaching to meet the needs of an increasingly diverse student body. One way of doing this is to teach without much regard for individuals, and then to remediate those who did not learn. A more desirable method is to diagnose the students' needs, learning styles, etc. and to prescribe a curriculum and pedagogy that best allows each student to learn. It is interesting to note that the methods and teaching strategies recommended for remedial instruction are those methods and strategies which should have been used in the first place.

If every teacher would use a diagnostic-prescriptive approach to teaching, very little remediation would be necessary. However, until that happens, teachers, especially those in the upper grades, high school and

college will need to be able to diagnose the errors students make and create instructional experiences that will allow the children to learn what was not learned earlier.

Discussions about whether colleges and universities should or should not offer remedial programs serve only to solve the problem at the administrative level. If students from inadequate high schools are not remediated in the college, they have few choices left. Until all high schools and elementary schools can provide adequate education for their pupils, society cannot ignore those who would have made it given a better school situation.

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